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Abhiroop Mukhopadhyay

Indira Rajaraman

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Indian Statistical Institute, Delhi
Planning Unit
7, S. J. S. Sansanwal Marg, New Delhi 110016, India

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Abhiroop Mukhopadhyay
Indira Rajaraman

Abstract:

An exogenously defined poverty line yields poverty headcounts between any two points in time that are a net outcome of the two-way traffic into and out of poverty. This paper argues that, for the rural Indian context, where housing is too lumpy and illiquid to be used for consumption smoothing, transitions in housing quality in cross sectional data sets can provide revealed evidence of household perceptions of downside risk to their current consumption levels. Using the two most recent NSS housing surveys (the 58th round for 2002, and the 65th round for 2008-09), composite housing quality classifications are unbundled, and binary wall quality is selected from cross-quartile behavior as the feature most responsive to rising household consumption levels. In both rounds, the incremental move to better quality declines beyond the consumption level at which half of all households are in better quality structures. The threshold consumption level at which this happens was lower in 2008-09 than in 2002 and reflects an improvement in housing conditions over the period. However, this effective saturation of the demand for the most basic element of better housing, much before actual saturation, provides a quantitative measure of the percent of households even in the topmost quartile that fears downside consumption risk.

Keywords: tracking poverty, rural housing

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Abhiroop Mukhopadhyay is Assistant Professor, Indian Statistical Institute, Delhi Centre. The work on this paper was done while he was Sir Ratan Tata Senior Fellow at the Institute of Economic Growth, Delhi. Indira Rajaraman is Honorary Visiting Professor, Indian Statistical Institute, Delhi Centre.

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1. Introduction

Poverty assessments through independent cross-sectional samples of the National Sample Survey (NSS) variety can track poverty over time only as a net outcome of the two-way traffic out of, and into, poverty. Notwithstanding conflicting stands on where exactly the poverty line should be positioned for India, there is a fair degree of consensus across definitional schools that the poverty headcount shows a declining trend. This result is invariant to whether one uses the official poverty line (28.3 % for 2004-05 according to the planning commission or the poverty line advocated by the Tendulkar committee, which places the headcount at 41.8 % for 2004-05).[1]

Very early results in the literature on rural poverty show that there is yearly fluctuation around any poverty trend, as a result of the exogenous weather factor in rain-dependent agriculture (Ahluwalia, 1978). Non-synchronous shocks across the 15 agro-climatic regions in the land mass of India add a further regional netting out across regions, so that such yearly movements in the national headcount will be the net outcome of movements into poverty in regions hit by adverse external shocks, and movements out of poverty in regions that experienced a good agricultural year. These exogenous shocks by definition affect contiguous groupings of households, but there will also be idiosyncratic shocks specific to the household (for example, shocks to health). Consumption smoothing in the face of income variability, whether idiosyncratic or not, is enabled if there is a financial market offering liquidity against asset collateral. Housing is the major durable asset owned by households, but in rural India in particular, it differs from all other assets in that it is not readily encashable. Housing is physically rooted in its location, and unless there is a sufficient flow of population, as would be the case in an urban setting, it has no collateral value.

Housing varies by quality, and therefore transitions in housing quality are potentially useful markers of the confidence of a household in its future income stream. Higher quality housing should normally exhibit income elasticity, and show a rise with income (or consumption) level, constrained at all times by the illiquidity of the asset acquired, in the event of downside income risk. Cross-sectional data on housing quality in principle therefore offer the prospect of revealing the income (or consumption) level at which confidence in staving off downside risk for the lumpy and irreversible move to be made is sufficiently widespread that there is saturation in terms of transition to the higher quality level. At this point, the marginal coefficient for transition to higher quality housing, in response to changes in income, should begin to decline, relative to lower levels of income.

Ideally, panel data on the same set of sample households over time can reveal whether there are any downward movements of a particular household from higher to lower housing quality, contrary to the assumption made here that the key feature of housing, as distinct from other movable consumer durables, like bicycles or domestic gadgets like fans, is its irreversibility. If the assumption holds, the further corollary is that the quality of housing is an imprint of its prior consumption confidence, possibly unrelated to the actual consumption level recorded at the time of survey.

Recent work using nation-wide panel data (Krishna and Shariff, 2011) examine similar issues of transition into and escape from poverty. However, in their case they look at long run poverty transitions from 1993-94 to 2004-05 and model the role of household correlates. While such data are always preferable, they are sporadic. Most national level data sets that are more periodic in nature are cross sectional, such as those collected by the NSSO.

This paper points out a unique way to look at poverty; one that endogenizes household expectations of risk and future income. Accordingly, this paper examines the evidence on rural housing from two recent NSS surveys of housing, to understand housing quality transitions across the per capita consumption spectrum, divided into four quartiles.

Section 2 of the paper describes the data used from the housing surveys in the 58th round, which was canvassed over the period July to December 2002 (in effect, a half-round), and the 65th round, which covered the period July 2008 to June 2009. NSS housing surveys collect very detailed information on all aspects of housing, with the consumption level of the household recorded as part of the ancillary information on the sample household.[2] Although the two housing rounds cover both rural and urban sectors, this paper is confined to the rural sector. In urban India, a bundled indicator of housing quality and location may show a more systematic relationship with consumption or income levels than housing quality alone.

Section 3 describes the method used to locate the consumption quartile in which, from the evidence of marginal probabilities of transition from lower to higher quality housing, the demand for higher housing begins to get saturated. Therefore, the residual percentage of households in the upper quartiles who have not improved their housing yields an initial handle on the percentage not sufficiently sure of their location at that consumption level to embed themselves irreversibly in higher quality housing.

An unresolved issue with rural housing is the degree to which observed data may have been affected by rural housing interventions, such as the Indira Awaas Yojana (IAY). The IAY first started as a sub-scheme of the Rural Labour Employment Guarantee Scheme in 1985-86, and became an independent scheme in 1996.[3] Since both our rounds are from periods much later to that, they are equally affected by this scheme. Therefore one can make the case that the effect of the scheme is netted out when comparing 2002 to 2008-09. However, given that IAY has seen increased funding in recent years, one could still make the case that recent improvements in housing are a result of IAY. Since IAY is targeted at the BPL population, it is clear that this will cause an increase in the number of poor people with pucca houses. However, this is unlikely to affect the turning point in the marginal probabilities of transitions in quality of housing which take place at quartiles of consumption expenditure much higher than the poverty line.

Section 4 concludes.

2. Data and Methods

The NSS housing surveys collect information on various aspects of the structure in which the sample household resides. Of all the features of housing quality on which information is collected, including the number of rooms, and access to water and sanitation, the most readily observed features are the type of wall and roof. The wall and roof are each classified in one of nine mutually exclusive categories. Table 1 shows that categories 1-4 in respect of each are classified as kutcha (impermanent), and 5-9 as pucca (permanent).

[Table 1 around here]

A composite classification of the quality of the house as a whole is provided in the official NSS reports on the housing surveys, into kutcha housing (both wall and roof in categories 1-4), pucca housing (wall and roof in categories 5-9), and a residual semi-pucca category, in which wall and roof do not fall in the same numbered range of categories. Table 1 shows the data from the NSS reports on three rounds, the 49th (January to December 1993), 58th (July –December 2002) and the 65th round (July 2008 to June 2009).

The figures suggest a substantial improvement in housing condition in rural areas, with kutcha structures down from 31 to 17 percent over the fifteen years from 1993 to 2008-09, and pucca structures up from 32 to 55 percent. When, as happened in the 58th round (2002), roofs of tile/slate are assigned out of the pucca category into the semi-pucca, the share of pucca structures goes down substantially from 48 to 36 percent.

Clearly, the housing quality descriptives need to be unbundled , and this is generated from the primary data for the latest round in 2008-09 in table 2, by monthly per capita consumption quartile. These are quartiles of households, not of the total population, and are formed after weighting each sample household by the household multiplier supplied by the NSS. The official poverty line for 2004-05 was a monthly per capita consumption of Rs. 356.35. The equivalent at 2002-03 prices works out to Rs. 334. All consumption figures for 2008-09 in the table are shown at 2002-03 prices. The poverty line at 2002-03 prices is just a little above the cut-off for quartile 1.

[Table 2 around here]

Three features of the quartile wise data are especially noteworthy. First, the percentage share of the kutcha wall-kutcha roof combination declines sharply across quartiles, but so does the share of structures with a tiled or other pucca roof overlaid on a kutcha wall. Structures with kutcha walls, aggregating across roof types, decline steadily from 54 percent of total structures in quartile 1 to 23 percent in quartile 4. The decline in share from quartile 1, to 44 percent in quartile 2, is particularly sharp. This cross-quartile behavior, in particular the substantial movement out of kutcha walls going from quartile 1 to quartile 2, reveal kutcha walls to be inferior to pucca walls. The overall share across all quartiles of this (revealed inferior) type of structure with kutcha walls is 40 percent, much higher than the 17 percent share of the composite kutcha structure.

The second noteworthy feature, is that when structures are aggregated by roof type, the share of structures with a kutcha roof is much lower even in the lowest quartile, at 29 percent, and declines

much less sharply going into quartile 2. The overall share across all quartiles of structures with a kutcha roof is only 22 percent. Kutcha wall structures are more likely to have a non-kutcha roof of tile, or better than tile, even in the lowest quartile. Also, once the irreversible transition to a pucca wall is made, there is a small stable percent of structures staying with a kutcha roof cover pending the pucca roof. Thus, the share of structures with a kutcha roof, irrespective of wall quality, is much flatter across quartiles as compared to kutcha walls.

Third, the spread between the quartiles in housing quality is much narrower than the spread in mpce, shown in the table. The mean mpce in the upper quartile is 3.5 times that in the lowest quartile, but the percent share with pucca walls rises from 46 percent in the lowest to only 77 percent in the highest quartile. (The consumption expenditure figures in the table are all at 2002-03 prices). Even in the uppermost quartile, the share of households with kutcha walls is as high as 23 percent. This is somewhat startling. Likewise the share of households with pucca walls in the lowest quartile, at 46 percent, is also much higher than might be expected. The shares by roof quality are even flatter across quartiles.

These descriptives point to wall, rather than roof quality, as the feature of housing quality that rises most sharply with household consumption levels. The incremental change in wall quality is sharpest between quartiles 3 and 4.

The issue of the high share of pucca walls in the lowest quartile remains puzzling. There are two possible explanations. One is that this is the result of interventions such as the Indira Awaas Yojana (IAY). A second possibility is that this is the result of movement downward into poverty of households that had earlier been able to upgrade wall quality.

Table 3 shows quartile specific housing shares in the 58th round at the quartile cut-offs corresponding to those in the 65th round (for comparability across the rounds, but as shown in table 3, the cut-offs yield quartiles approximately here as well). Here again, the pucca wall share in the lowest group is 38 percent, rising to 71 percent in the highest group. It seems implausible that so large a share in the lowest quartile between NSS rounds would be a result of downward movement of households on the consumption scale, so the high percentages among the lowest group has to be a result of policy interventions among designated poverty groups. This if anything only heightens the puzzle over the lack of full coverage in the highest quartile groups of a permanent wall, the most basic dimension of housing quality.

[Table 3 around here]

Comparing across the rounds, 51 percent of the lowest two quartiles in 2008-09 had pucca walls, as opposed to only 42 percent of those at equivalent consumption levels in 2002. Cumulatively the bottom three quartiles in 2008-09 had 55 percent, higher than the overall pucca-wall share of 53 percent in 2002. If the move to pucca walls is taken as irreversible, then the rise in the share of pucca wall structures is plausible even in classes defined by equivalent consumption levels, since the change would

reflect the addition to the stock on account of households which experienced an improvement in mpce within the same cut-off markers.

3. Results

Table 4 shows the results from a probit specification estimating the probability of transition to a pucca wall estimated separately for each quartile, with controls for NSS state-regions (75 state regions as defined in the 58th round. These allow for even more flexibility than considering only agro-climatic zones which would require coarser partitions of the country). The quartile-specific estimation allows the estimation of marginal coefficients at the average of ranges of per capita consumption, specified by (in this case, equal numbers of) households falling in the range.[4]

We test the following specification across n sample households in each survey, and the 75 state-regions, as defined in the 58th round, in which the sample household falls:

$$\Pr(y_i = 1) = \Phi(\alpha + \beta.x_i + \sum_{j=1}^{74} \delta_j.D_{Sj}); i = 1,...,n$$

where y_i i is the binary dependent variable which takes a value of one if the household dwelling has a pucca wall, and zero if it does not, for the ith sample household. x_i is the monthly per capita consumption of household i and D_{Sj} is a dummy variable for the NSS region j, and is a catch-all residual capturing the agro-climatic and economic environment in which the sample household falls.

The marginal probability of transition to a pucca wall, estimated at the average of each quartile, for every rupee increase in mpce, rises from quartile 1 to quartile 2 in 2008-09, but then declines in quartile 3 and then further in quartile 4. For durables like a pucca wall, the decline in the marginal coefficient would normally be indicative of saturation. However, at the start of the consumption range defining quartile 3, half of households cumulating across the bottom two quartiles were without a pucca wall. Within quartile 3, 37 percent of households were without a pucca wall. The further sharp decline in the marginal coefficient in quartile 4 coexists with 23 percent of households in that quartile without a pucca wall.

The marginal coefficients for the 58th round segments, are estimated at the quartile cut-offs of the 65th round so as to be for comparable consumption ranges. These approximate very roughly to quartiles of the 58th round itself. The marginal coefficients for this round show a decline only in quartile 4.This implies that over time, there has either been an improvement in housing or households are now less secure about their future incomes. Since the proportion of households with pucca walls has risen in every quartile, it is more likely that our results reflects an improvement in housing quality.

[Table 4 around here]

The estimates were also run for total household expenditure rather than mpce, within the same quartiles defined by mpce, to check for whether the pattern of transitions might change with total expenditure, which incorporates household size. The results are broadly similar, except that in 2008-09, the marginal coefficient rises slightly in quartile 3 relative to quartile 2, before declining in quartile 4. The negative coefficient in the lowest quartile for 2002, is clearly because of household size in this quartile increasing more than proportionately with household total expenditure. This result in particular suggests that mpce is the better indicator of transitions in housing quality. If the move to a pucca wall, as a decision not easily reversed or encashable, is taken as an indicator of confidence in the sustainability of current consumption levels, these results in conjunction with the stock descriptives in tables 2 and 3 suggest some structural similarities in terms of confidence about downside consumption risk in 2008-09 relative to 2002. The marginal coefficients decline in 2002 in quartile 4, at a cumulative starting stock of 47 percent pucca walls, and in 2008-09 at quartile 3, at a starting cumulative stock of 51 percent. Beyond the consumption level at which about half of all households have a pucca wall, the incremental move to a pucca wall declines.

The coefficient for the lowest quartile is much higher in 2008-09 than in 2002, which once again heightens the puzzle over IAY interventions for households below the poverty line. If that intervention had operated at the lowest end of the quartile, it should in principle have flattened the slope. But instead the marginal coefficient has risen in 2008-09 for this quartile relative to 2002 quite sharply, suggesting that the benefits of this programme accrue to those at the top end of the poverty range.

4. Conclusions

By the latest rural housing survey for 2008-09 from the 65th round of the NSS, structures classified as kutcha (a kutcha roof on a kutcha wall) account for 17 percent of all structures. However, when structures are not assigned a unique composite classification, and are unbundled by type of wall and roof, the share of rural structures with a kutcha wall (of mud or bamboo), at 40 percent, is far higher. The overlay of a tile or metal sheet roof on a kutcha wall accounts for the difference. Structures with a kutcha wall, aggregating across roof types, show a sharp decline in share across consumption quartiles in both the 65th round, and the 58th round housing survey for 2002. Pucca walls show a corresponding increase in share, revealing these to be clearly preferred, with the incremental shift in wall quality sharpest between quartiles 3 and 4. By contrast, the share of structures with a tile or other pucca roof, irrespective of wall quality, is much flatter across quartiles. These descriptives point to wall, rather than roof, type as the best indicator of improvements in housing quality as households move up the consumption scale.

A transition to a pucca wall is also irreversible, because it is physically rooted in its location, and unless there is a sufficient flow of population, as would be the case in an urban setting, has no collateral value. Following from this, the transition of a household to a pucca wall will be constrained by household assessments of the sustainability of their current consumption levels. These estimates of sustainability

could differ for different ranges of household monthly per capita consumption (mpce). Also, at higher ranges of mpce, the probability of transition will be constrained by the received stock of structures that have already made the transition.

The paper therefore estimates, separately for each consumption quartile, the marginal probabilities of transition to pucca walls, for every rise of one rupee in mpce, with dummy variables controlling for the state-region in which the household is located. The marginal probability of transition from a kutcha to a pucca wall in 2008-09 rises from quartile 1 to quartile 2, but then declines in quartile 3 and then further in quartile 4. For durables like a pucca wall, the decline in the marginal coefficient would normally be indicative of saturation. However, at the start of the income range defining quartile 3, 51 percent of households cumulating across the lowest two quartiles were without a pucca wall. Within quartile 3 alone, 37 percent of households were without a pucca wall. The further sharp decline in the marginal coefficient in quartile 4 coexists with 23 percent of households in that quartile without a pucca wall. This effective saturation of the demand for the most basic element of better housing, much before actual saturation, provides a quantitative measure of the percent of households even in the topmost quartile that fears downside consumption risk.

In 2002, the marginal coefficient declines only in quartile 4 (using the same real mpce cut-offs as 2008-09), at a cumulative stock of 47 percent pucca walls. Since the decline in the marginal coefficient occurs in 2008-09 at quartile 3, at a cumulative stock of 51 percent with pucca walls, the incremental move to a pucca wall declines in both years beyond the real consumption level at which about half of all households have a pucca wall, where that consumption level itself is lower in 2008-09 than in 2002. If the move to a pucca wall, as a decision not easily reversed or encashable, is taken as an indicator of confidence in the sustainability of current consumption levels, these results suggest that the structural parameters defining fear of downside consumption risk have not changed appreciably during this period, despite the rise in current mpce between the two survey years. The decline in the share of kutcha wall structures from 47 percent in 2002 to 40 percent in 2008-09, and the corresponding rise in pucca wall structures from 53 percent to 60 percent, does mark a slight improvement in the rural housing stock between 2002 and 2008-09.

The spread between the quartiles in housing quality is much narrower than the spread in per capita consumption levels. The mean monthly per capita expenditure (mpce) in the upper quartile in 2008-09 is 3.5 times that in the lowest quartile, but the percent share with puccaa walls is 77 percent in the highest quartile, as against 46 percent in the lowest quartile.

Finally, the high share of structures with pucca walls at the lowest quartile is possibly a result of the rural housing scheme (IAY). The marginal coefficient for the probability of transiting to a pucca wall in the lowest quartile is much higher in 2008-09 than in 2002. If that intervention had operated at the lowest end of the quartile, it should in principle have flattened the slope. But instead the marginal coefficient has risen in 2008-09 for this quartile relative to 2002 quite sharply, suggesting that the benefits of this programme accrue to those at the top end of the poverty range.

Table 1 Rural housing categories by type

Categories for wall and roof			
1-4	Bamboo/reeds(1); mud/mud bricks(2); canvas/cloth(3); other kutcha(4)		
5	Timber (wall); Tiles/slate (roof)		
6-9	Burnt bricks/stone(6); metal sheets(7); cement with brick or concrete(8); other pucca(9)		
Composite standard classification	Kutcha (%)	Semi-pucca (%)	Pucca (%)
1993 (49th round)	31.7	36.0	32.3
2002 (58th round)	21.3	30.3	48.4
2008-09 (65th round)	17.0	27.6	55.4
Composite alt classification			
2002 (58th round)	21.3	42.8	35.9

Source:NSSO reports on Housing (2002 and 2008-09)

Notes: The standard composite classification of structures into kutcha (both wall and roof 1-4) and pucca (both wall and roof 5-9) carried a residual semi-pucca category with combinations of pucca walls (5-9) and kutcha roofs (1-4), as also structures with kutcha walls and pucca roofs. An alternate composite in the 58th round assigned tiled roofs (category 5) to the semi-pucca category, so that a pucca structure required roof categories 6-9. The estimates for that round were regenerated to be comparable with the 49th and 65th rounds.

Table 2 Wall and roof quality by quartile (percent share), 2008-09

	Quartile 1	Quartile 2	Quartile 3	Quartile 4	Total
Mean mpce, 2002 prices (Rs.)	258.34	379.63	507.68	907.42	510.06
Max mpce, 2002 prices (Rs.)	326.57	433.87	594.82	29678.62	29678.62
Wall quality percentages					
K-wall, K-roof	23	19	16	9	17
K-wall, tiled roof	22	15	12	8	14
K-wall, non-tile pucca roof	9	9	9	6	9
K-wall subtotal	*54*	*43*	*37*	*23*	*40*
K-wall, cumulative	*54*	*49*	*45*	*40*	
P-wall, kutcha roof	6	5	4	3	4
P-wall, tiled roof	9	11	12	12	11
P-wall, non-tile pucca roof	31	41	46	62	45
P-wall subtotal	*46*	*57*	*62*	*77*	*60*
P-wall, cumulative	*46*	*51*	*55*	*60*	
Total	100	100	100	100	100
Roof quality percentages					
K-roof	*29*	*24*	*20*	*12*	*22*
Tiled roof	*31*	*26*	*24*	*20*	*25*
Non-tile pucca roof	*40*	*50*	*56*	*68*	*53*
Total	100	100	100	100	100

Source: Authors' calculations from the 65th round housing survey of the NSS, covering the period July 2008 to June 2009.

Notes: Household quartiles are marked off by rupees per capita monthly consumption expenditure (MPCE) at 2002 prices, deflated by the Consumer Price Index for Agricultural Labourers. All figures are obtained after weighting by household weights, not population weights,

Table 3 Wall and roof quality by quartile (percent share), 2002, using quartile cut-offs from the 65th round (2008-09)

	Quantile 1	Quantile 2	Quantile 3	Quantile 4	Total
Mean mpce, 2002 prices (Rs.)	245.57	380.01	500.08	843.98	492.63
Max mpce, 2002 prices (Rs.)	326.57	433.87	594.82	8000.00	8000.00
Percent households at 65th round quartile cut-offs	25.31	26.62	22.88	25.2	
Housing quality percentages					
K-wall, K-roof	31	24	19	11	21
K-wall, tiled roof	24	21	17	12	19
K-wall, non-tile pucca roof	7	9	8	6	7
K-wall subtotal	*62*	*54*	*44*	*29*	*47*
K-wall, cumulative	*62*	*58*	*53*	*47*	
P-wall, kutcha roof	4	5	5	3	4
P-wall, tiled roof	11	11	13	16	13
P-wall, non-tile pucca roof	23	31	38	52	36
P-wall subtotal	*38*	*47*	*56*	*71*	*53*
P-wall, cumulative	*38*	*42*	*47*	*53*	
Total	100	100	100	100	100

Source: Authors' calculations from the 58th round housing survey of the NSS, covering the period July to December 2002.

Notes: Household quantiles are marked off using the same cut-offs which marked off household quartiles in the 65th round.

Table 4 Marginal coefficients for probability of transition to a pucca wall, by mpce quartiles for the 65th and 58th rounds (rural)

Average marginal effect of one rupee increase in mpce	Unit	Quartile 1	Quartile 2	Quartile 3	Quartile 4
2008-09	Exp (-4)	2.982	6.721	2.920	0.933
2002	Exp (-4)	1.630	6.191	8.231	1.609
Average marginal effect of one rupee increase in total hh con exp					
2008-09	Exp (-4)	0.301	1.324	1.328	0.168
2002	Exp (-4)	-0.581	0.610	1.184	0.432

Source: Authors' calculations from the 58th (2002) and 65th (2008-09) round housing surveys of the NSS.

Notes: The nominal consumption levels in the 65th round were deflated to 58th round prices. Quartiles were formed with respect to consumption levels in the 65th round and the same absolute mpce quartile cut-offs were used for the 58th round as well (see table 3).

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[1] Himanshu et al (2010) provides a detailed description of these alternative poverty lines.

[2] The samples drawn for the consumption and housing surveys in any round are different so that no link is possible between the two.

[3] http://rural.nic.in/iaygd2.html

[4] Alternatively we could have considered a quadratic specification in terms of per capita consumption but this would impose a parametric shape to our relationship.